





# **Storm Damage Report**

for

Memorial Inn & Suites 9535 Katy Freeway Houston, Texas 77024



# Forensic Building Science, Inc.

657 Lincoln Avenue St. Paul, Minnesota 55105 Phone: 651-222-6509

Fax: 651-528-6237

www.forensicbuildingscience.com

## **RJH & Associates**

12598 U.S. Hwy 98, #200 Miramar Beach, FL 32550 Phone: 850-608-6221

Fax: 850-608-6223 www.rjhassoc.com



# **Project Info**

Client: Raizner Slania

Project Address:

Memorial Inn and Suites
9535 Katy Freeway
Houston, TX 77024

Harris County

Insurance Carrier: Arch Specialty
Insurance Company

Policy #: ESP 7302074-01
Claim #: 000013107760

Date of Loss: August 26-28, 2017

#### FIELD REPORT FOR INITIAL STORM DAMAGE INVESTIGATION

#### 1.0 Background Information:

Forensic Building Science, Inc. (FBS) was contacted by Raizner Slania Law Firm (RS) to provide an inspection of the exterior and interior of the above-mentioned property and to ascertain the extent of damage caused by wind and weight of water, including tornadic activity which was reported to have occurred on or around August 26-28, 2017. RJH & Associates, Inc. (RJH) worked in cooperation with FBS to perform their inspections.

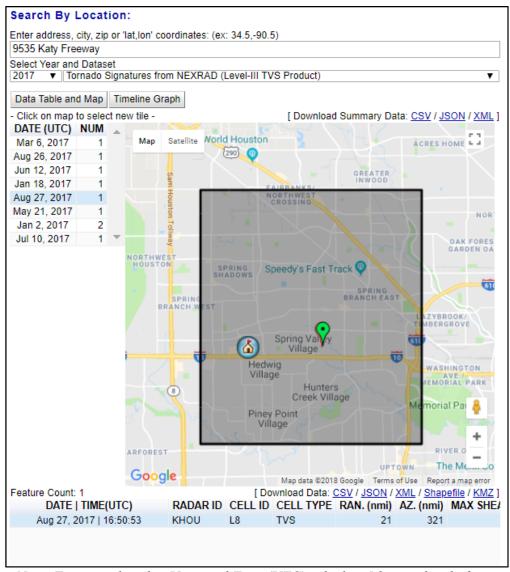
- 1.1 Summary of Hurricane/Tropical Storm Harvey from the Washington Post: <a href="https://www.washingtonpost.com/graphics/2017/national/harvey-impact/?utm\_term=.a1555e841c24">https://www.washingtonpost.com/graphics/2017/national/harvey-impact/?utm\_term=.a1555e841c24</a>
- 1.2 Reference Information on August 27, 2017 Storm Event NOAA Storm Events Database – August 26, 2017 through August 30, 2017 Event Details:

Event	Tropical Storm
State	TEXAS
County/Area	HARRIS
WFO	HGX
Report Source	Emergency Manager
NCEI Data Source	csv
Begin Date	2017-08-26 00:00:00.0 CST-6
End Date	2017-08-30 00:00:00.0 CST-6

Deaths Direct/Indirect	<b>36/2</b> (fatality details below, when available)
Injuries Direct/Indirect	0/0
Property Damage	10.00B
Crop Damage	
Episode Narrative	Harvey made landfall as a category 4 hurricane near Rockport, Texas during the evening of August 25th. The storm then weakened to a tropical storm and slowed, looping back and tracking over SE Texas then back over the Gulf of Mexico making a second landfall along the Louisiana coast during the early morning hours of August 30th. Over that 5 day period over Southeast Texas TS Harvey produced catastrophic flooding with a large area of 30 to 60 inches of rain, 23 tornadoes, tropical storm force winds and a moderate storm surge near Matagorda Bay. In some of the heavier bands rain fell at a rate of over 5 inches per hour. This copious record amount of rain over a led to catastrophic flooding. Thousands of homes, businesses, and roads were flooded due to flash flooding and sheet flow from long duration intense rain. Main stem rivers and adjoining tributaries, creeks and bayous reached full capacity and came out of their banks and this also contributed to the massive flooding across southeastern Texas.
Event Narrative	Harvey made landfall as a category 4 hurricane near Rockport, Texas during the evening of August 25th then slowed and looped back tracking over SE Texas, back over the Gulf of Mexico then made a second landfall along the Louisiana coast during the early morning hours of August 30th. Over that 5 day period over Southeast Texas TS Harvey produced catastrophic flooding with a large area of 30 to 60 inches of rain, 23 tornadoes, tropical storm force winds and a moderate storm surge near Matagorda Bay. Catastrophic flooding occurred along nearly all bayous and rivers in Harris County.

# NOAA Severe Weather Inventory: Tornado Signatures from NEXRAD: August 27, 2017

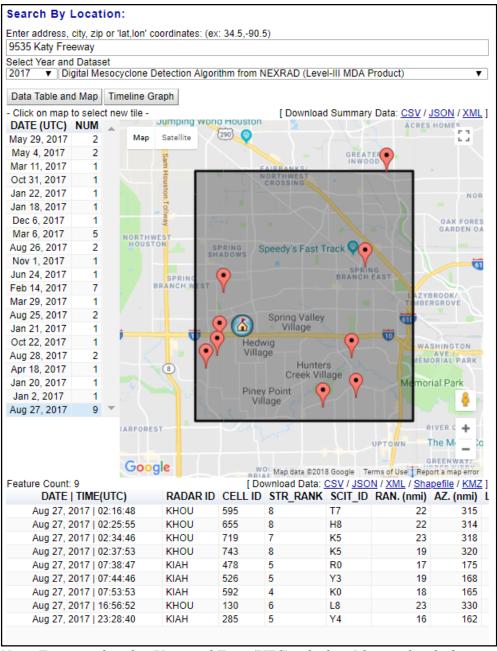
A tornado signature was reported by NEXRAD 2 miles east of the site.



Note: Times are listed in Universal Time (UTC), which is 5 hours ahead of Houston's Central Time.

# NOAA Severe Weather Inventory: Digital Mesocyclone Detection Algorithm from NEXRAD: August 27, 2017

Nine digital mesocyclone events were recorded in the area with one occurring 1/2 mile west of the site.



Note: Times are listed in Universal Time (UTC), which is 5 hours ahead of Houston's Central Time.

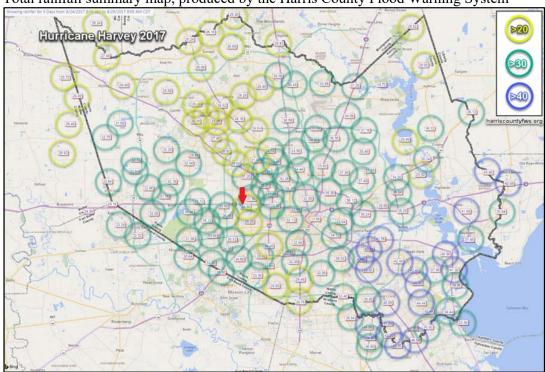
# <u>Weather Underground – Weather history for August 26, 2017 and surrounding dates:</u>

Weather Underground historical weather data from the three nearest weather stations are not displayed on the website from August 19, 2017 through September 19, 2017. This is likely due to equipment or communication outages at the weather station during Tropical Storm Harvey. Weather Underground generically explains missing data in the site's FAQ section as follows:

"When a city suddenly disappears from our site, it is usually a station that has not sent us a data report for over 24 hours. We removed all data over 24 hours old from our site to avoid providing outdated information. These outages are usually due to communications or equipment failures at the weather station and outages can last from a few days to weeks"

#### **Rainfall Information:**

Total rainfall summary map, produced by the Harris County Flood Warning System



Red arrow is placed at location of the Memorial Inn. Map indicates approximately 30" of rain fell in the vicinity between August 24 and 29, 2017.

#### 1.3 **Satellite Image of the Property:**



Google Earth imagery dated October 28, 2017.

# 1.4 <u>Inspection personnel present</u>:

- Kevin Steinke, Field Investigator, FBS January 31 February 1, 2018
- Robert Hinojosa, PE, RRC, RWC, REWC, RBEC
   President/CEO, RJH & Associates February 1, 2018

#### 1.5 The following claim related documents have been received:

- McLarens, J. Phillip Dempsey II RCV Insurance Estimate (\$62,336.27), dated November 30, 2017
- Envista Forensics Report of Findings with attachments A and B, dated October 20, 2017

#### 1.6 Previous or Subsequent Damage from Another Event(s):

According to property owner Khalid Kajani, the fifth (and southernmost) wing of the building did have multiple known interior leaks prior to Tropical Storm Harvey, however, these were not leaking prior to the storm event. For that reason, the owner was not seeking insurance coverage for interior damage in that wing of the building. Other areas of concern that may have arisen prior to Tropical Storm Harvey were minor in nature and regular maintenance was able to resolve those issues in a timely manner. Since Tropical Storm Harvey, any attempt at post storm repairs have been too extensive for regular maintenance to perform.

#### 1.7 Loss Related Repairs:

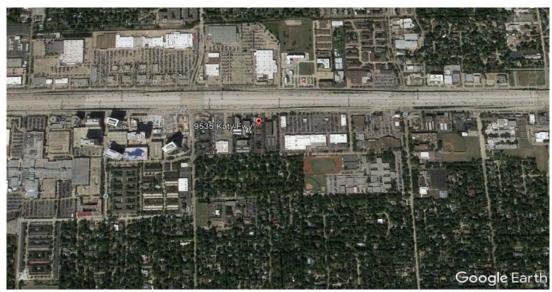
Minor temporary repairs have been made at numerous locations on the roof since the storm event. Repairs have also been made to some of the interior spaces, specifically, to the rooms on the first floor that sustained carpet damage.

#### 1.8 The following additional documents were used for reference:

- According to the City of Houston, TX website, they have adopted the following building codes:
  - o 2012 International Building Code with local amendments
  - o 2012 International Energy Conservation Code with local amendments

- o 2012 International Fire Code with local amendments
- o 2012 Uniform Mechanical Code with local amendments
- o 2012 Uniform Plumbing Code with local amendments
- o 2017 National Electrical code
- o 2015 International Energy Conservation Code with local amendments
- Amendments can be found here: <a href="https://www.houstonpermittingcenter.org/code-enforcement/customer-assistance-code-development-cacd-section.html/#current">https://www.houstonpermittingcenter.org/code-enforcement/customer-assistance-code-development-cacd-section.html/#current</a>
- Photographs from site visits by FBS.
- Haag Education Haag Certified Roof Inspector Program, Commercial Edition.
- ANSI/SPRI ES-1 Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems. 1998, 2003, 2011. Code reference standard.
- ARMA technical bulletin 115 The Effects of Ponding Water
- SPRI, Construction-Generated Moisture and Its Effect on Roofing Systems, August 2008.
- E108-10a Standard Test Methods for Fire Tests of Roof Coverings.
- RS-738-Insulation Installation Instructions
- ASHRAE R-Value Climate Zone Map
- Standards: FM 4470, UL 1256, and CAN/ULC S126M
- Texas Board of Professional Engineers, Advisory Ruling October 7, 2004
   "Policy Advisory Opinion Regarding Structural or Mechanical Modifications to Building Roofs."
- Building Damage Issues in Tornadoes. Severe Local Storms 22<sup>nd</sup> Annual Conference. 2004 Marshall.
- Wind Speed Analyses of Tornadoes Based on Structural Damage. Wolde-Tinsae, Porter and McKeown. July 1985
- E2128-17 Standard Guide for Evaluating Water Leakage of Buildings
- E1105-15 STM for Field Determination of Water Penetration of Installed Ext Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Differential
- ACI 524R-93 Guide to Portland Cement Plastering Reported by ACI Committee 524
- PCA Repair of Portland Cement Plaster

## 2.0 Structure Information:



Google Earth imagery of terrain surrounding property dated October 28, 2017.

According to the Harris County Appraisal District website, the 29,145 square foot building at 9535 Katy Freeway was originally constructed in 1970. The two-story building is a concrete and steel structure with a slab-on-grade foundation. Floors and roof deck are concrete. The exterior walls are constructed with CMU and a parging surface covered by a stucco veneer. The veneer is painted. The roofing system is a low-slope built-up roof (BUR) with gravel ballast. Beneath the BUR is 1/2" of fiberglass insulation. Beneath the fiberglass insulation is a concrete deck. The area is surrounded by properties consistent with the definition of Exposure B in ASCE 7.

#### 3.0 <u>Site Observations</u>: [See Photo reports for all photos of damage]

## 3.1 Exterior Observations



Figure 1



Figure 1A

- The ceiling of the porte-cochere was water damaged and the finish was removed for safety reasons.
- Many of the window air-conditioning units had damage to the plastic fins. Some were said to be broken as a result of the storm, while others were broken from unrelated causes.



Figure 2

- Several windows were broken from wind or wind-borne debris. Units with broken windows include 104, 114, 116, 117, 124, 166, 171, 177, 184, 209, 257, 261, and 262.
- Some windows have been replaced and others have been removed, but not yet replaced.
- Gaps identified around window frames were new in apprearence and were consistent with wind damage. These gaps should be considered storm created openings.



Figure 3



Figure 3A

Widespread damage identified to the exterior wall finish along the bottom of
walls due to standing water during the tropical storm. This was observed by
FBS and confirmed by property management. Water caused the parging to
seperate from the CMU at a number of locations. This damage typically
extended up 12" from the grade line.



Figure 4

#### 3.2 **Roof Observations**



Figure 5

- Parapets are capped with metal. The interior side of the 12-inch high parapets were covered with BUR that extended up the wall and under the metal cap. The exterior side was sloped and clad with concrete tiles, except for the east elevation, which was clad with 3-tab asphalt shingles. Along the southern end of the east elevation, concrete tiles were installed with battens fastened directly through the existing 3-tab shingles.
- Scour and cap sheet seperation and debonding was observed on the BUR.[See Figure 5]
- Decorative 6- foot high wood-framed parapets were installed on top of the roof above the functional parapets along the north elevation and the west ends of each wing. The interior side of these parapets were clad with plywood. The top of these parapets were clad with exterior insulation and finish system (EIFS) which was capped with metal. During our inspection, a crew was replacing plywood that had been dislodged during the storm event. In general the plywood was in poor condition.



Figure 6

• 2" x 4" non-conventional wood bracing used for tall parapets.



Figure 7



Figure 8 Parpet pushed inward

Expansion joints running east-west observed between wing sections, with temporary patching done on sections.



Figure 9

- Roof areas where an additional flood coat was applied
- A temporary repair with a black tarp observed between the first and second wings.



Figure 10

## 3.3 Roof Cores

Three roof cores were taken to observe the composition of the roof and determine if there are wet areas beneath the materials.



- Located on the 1<sup>st</sup> (northernmost) wing, 13' from South wall, 50' from East wall
- Gravel Ballast

- ½" 3-ply BUR
- ½" fiberglass insulation
- Concrete deck
- All materials were wet

Core #2



- Located on the 3<sup>st</sup> (middle) wing, 8' from North wall, 32' from West wall
- Gravel Ballast
- ½" 3-ply BUR
- ½" fiberglass insulation
- Concrete deck
- All materials were wet

**Core #3** 



- Located on the 5<sup>th</sup> (southernmost) wing, 7' from South wall, 8' from West wall
- Gravel Ballast
- ½" 3-ply BUR
- ½" fiberglass insulation
- Concrete deck
- All materials were wet

## 3.4 Interior Observations

Because many units were rented, not all units were available to inspect during our visit. We did, however, inspect most of the rooms with reported damage. Below is a list of the units inspected by FBS with damage indicated. All of the units listed were damaged by Tropical Storm Harvey. Units in the 5<sup>th</sup> wing were not inspected by FBS as the damage in those units was considered by management to be pre-existing.

# **Second Floor:**





Figure 11

- Water damage to laminate floor
- Water damage to ceiling
- Water damage to window shade
- Water damage to wall
- Water damage to baseboard

## <u>203</u>



Figure 12

- Water damage to ceiling
- Water damage to wall

# <u> 205</u>

- Water damage to ceiling
- Water damage to wall



Figures 13 and 13A

- Water damage to ceiling
- Water damage to wall
- Window missing

# <u>214</u>

- Water damage to ceiling
- Water damage to wall
- Carpet damage

# <u>215</u>

- Water damage to ceiling
- Water damage to wall
- Window damage

# <u>216</u>

- Water damage to ceiling
- Water damage to wall

# <u>218</u>

- Water damage to ceiling
- Water damage to wall

# <u>221</u>

- Water damage to ceiling
- Water damage to wall
- Water damage to carpet

# <u>223</u>

Water damage to ceiling

# <u>225</u>

• Water damage to ceiling

# <u>227</u>

- Water damage to ceiling
- Water damage to wall

# <u>229</u>

• Water damage to ceiling

# <u>233</u>

- Water damage to ceiling
- Water damage to wall
- Water damage to carpet

## <u>235</u>

- Water damage to ceiling
- Water damage to a lamp shade

## **Electrical Room #2**

• Water damage to ceiling

# <u>236</u>

• Water damage to ceiling

# <u>239</u>

• Water damage to ceiling

# <u>243</u>

- Water damage to ceiling
- Window missing
- A/C unit missing

#### <u>253</u>

- Water damage to ceiling
- Water damage to wall

# <u> 256</u>

- Water damage to ceiling
- Water damage to carpet
- A/C unit missing



Figures 14 and 14A

- Water damage to ceiling
- Water damage to wall
- Water damage to carpet
- A/C unit missing

# <u> 260</u>

• Water damage to ceiling

## **261**

- Water damage to ceiling
- Water damage to wall
- Water damage to carpet

# <u> 262</u>

- Water damage to ceiling
- Water damage to wall
- Water damage to carpet
- Water damage to window

**Electrical Room #4** 



Figures 15 and 15A

- Water damage to ceiling
- Water damage to wall
- Water damage to floor

# **264**

- Water damage to ceiling
- Water damage to wall

# <u>272</u>

Water damage to ceiling

## <u>274</u>

- Water damage to ceiling
- Water damage to carpet

# <u>278</u>

- Water damage to ceiling
- Water damage to wall

# **First Floor:**



Figures 16 and 16A

• Water damage to wall

## <u>103</u>

Water damage to ceiling

# <u>104</u>

Window was replaced do to wind damage

# <u>129</u>

Water damage to carpet

# <u>131</u>



Figure 17

- Water damage to carpet
- Water damage observed on wood dresser

# <u>133</u>

Water damage to carpet

# <u>136</u>

- Water damage to carpet
- Water damage to wall

# <u>149</u>



Figure 18

- Water damage to carpet
- Water damage to base of wall

# <u>152</u>

- Water damage to carpet
- Water damage to base of wall

# <u>157</u>

Water damaged carpet has been replaced

## <u>161</u>

Water damaged carpet has been replaced

# <u>162</u>

• Water damage to carpet

# <u>165</u>

- Water damage to carpet
- Water damage to ceiling
- Water damage to wall

# <u>166</u>

- Water damage to carpet
- Window has been replaced

## <u> 167</u>

• Water damage to carpet

## <u>168</u>

• Water damage to carpet

#### 171

- Water damage to carpet
- Water damage to base of walls
- Window has been replaced

## <u>177</u>

- Water damage to carpet
- Water damage to ceiling
- Water damage to wall
- Window has been replaced

## <u> 183</u>

- Water damage to carpet
- Water damage to wall



Figures 19 and 19A

- Water damage to carpet
- Water damage to wall
- Water damage to ceiling

#### 184

- Water damage to carpet
- Water damage to base of walls

#### **124 (Joined to Unit 184)**

- Water damage to carpet
- Observed broken window glass on ground

#### <u>185</u>

Water damage to carpet

#### **125 (Joined to Unit 185)**

• Water damage to carpet

## 4.0 Causation Statement

Based upon evidence collected from weather research and the physical inspection and roof, exterior wall and window assessment, we have concluded that the roof system, windows, some PTAC units, parapet walls, and some roof vents were damaged by the tornadic winds which occurred during the storm event. In addition, an overabundance of rain more than likely caused the roof system to be submerged causing water to damage the materials under the primary membrane, including adhesives, insulation and ceiling materials. These were still wet at the time of our inspection and will not recover. In our opinion, the low-slope built-up roof must be completely replaced. In our opinion, the current design of the parapet walls will not meet code at the time of the loss and will require complete replacement. In our opinion, complete replacement of the windows is necessary. The Work that has been done after the storm should be considered temporary in nature.

Based upon our training, education, experience, a reasonable degree of building science and engineering certainty and the information gathered during our inspections and weather data search, it is more likely than not that the observed damage to the roofing system is a result of Tropical Storm Harvey. On August 26-29, 2017 there was sufficient rain and wind to cause the above-referenced damage.

Based on our interior inspection of the building, we have concluded that it is more likely than not, that the interior water damage we observed was a result of Tropical Storm Harvey, with the exception of the prior damage, as reported.

Failure to completely remove and replace the damaged roof systems, windows, and parapets at the property will result in additional damage to the interior due to water intrusion.

## 5.0 Conclusions

Damage to the property caused by wind and excessive occurred on or around August 26-28, 2017. Historic rainfall impacted the property during this time period where approximately 30" of rain was reported at the location of the Memorial Inn. According to our review of applicable weather data listed above in section 1, sustained windspeeds were estimated between 40-50 mpg with gusts reaching 50-60 mph. The wind speeds reported are general to the area and can vary at specific locations. They are subject to a +/- 20% margin of error and do not account for tornadoes. Tropical Storm Harvey spawned many tornadoes, radar records indicated one which was reported 2 miles east of the site. There were also several mesocyclones detected in the area, with one being reported ½ west of the site. In our opinion, the wind that occurred on or around August 27, 2017 was sufficient to cause damage to the windows, parapets and the roofing system. In our opinion, full replacement of the roof system is required. Ensuing interior water damage from the storm event will require interior repairs.

The City of Houston has adopted the 2015 International Energy Code (IECC). In our opinion, as the carrier has demostarted coverage for the removal and replacement of sections of the interior ceilings damaged by water from the storm, the remaining parts of the roof assembly up to the roof covering [ working inside out] must also be replaced due to water damage. FBS cut roof cores and all cores were wet. In our opinion, additional coring will reveal either presence of water or signs that water did enter. Most if not all of the products used in the "roof Assembly" are not intended by the manufacturer to get wet and water damage to the materials directly behind the exterior roof envelope [the back side of the base sheet] are wet.

The Code Defines the following;

#### **2015 IECC**

**Definitions Chapter 2** 

ROOF ASSEMBLY. A system designed to provide weather protection and resistance to design loads. The system consists of a roof covering and roof deck or a single component serving as both the roof covering and the roof deck. A roof assembly includes the roof covering, underlayment, roof deck, insulation, vapor retarder and interior finish.

The key component here is that the energy code includes the **interior finish**.

Interior Finish is defined as:

**INTERIOR FINISH.** *Interior finish* includes *interior wall* and ceiling finish and interior floor finish.

Interior wall and Ceiling Finish isfurther defines as:

# **INTERIOR WALL AND CEILING FINISH.** The exposed interior surfaces of buildings, including but not limited to: fixed or movable walls and partitions; toilet room privacy partitions;

fixed or movable walls and partitions; toilet room privacy partitions columns; ceilings; and interior wainscoting, paneling or other finish applied structurally or **for decoration**, **acoustical correction**, surface insulation, structural fire resistance or similar purposes, but not including trim.

In our opinion, based on code language adopted by the City of Houston prior to the storm event, water damage to the interior ceilings from the storm event, which is not disputed, and discovery of wet materials in the roof assembly which includes not only the interior ceilings but also the roof assembly insulation, requires replacement of the wet insulation. In this case because of the concrete deck the only way to access the wet insulation is from the top, necessitating full roof replacement.

In our opinion, removal of the roof system to the concrete deck, drying out of the deck and installation of new above deck insulation with a new roof covering will be required as a result of damage from the storm event. Parapet walls will require replacement. New roof system will not allow for any gravel ballast.

In our opinion additional windows have been damaged by wind and require replacement. In our opinion, parging at the base of the structure was water damaged requiring removal and replacement. In our opinion, the scoipe of repairs allowed for by the carrier was deficient.

## 6.0 Requirements / Recommendations

Based on the findings during the investigation, we recommend the following steps be taken:

- 1. Follow all applicable building codes.
- 2. Remove all existing low-slope roofing materials down to the concrete decking.
- 3. Dry down concrete to roofing insulation manufactures requirements prior to installing new roof system.
- 4. Install a minimum of 3" of tapered polyiso board above deck.
- 5. Relocate all scuppers to accommodate height change.
- 6. Build new parapet with parapet bracing to meet current code requirements. Note: This will require special engineering design.
- 7. Replace all removed roofing materials and appurtenances with new similar materials.
- 8. Remove and replace all water damaged materials on the porte-cochere.
- 9. Repair any storm damage related interior water damage.
- 10. Replace all storm damaged windows.
- 11. Replace any storm damaged through-wall air conditioning units.

- 12. Remove water damaged interior materials and effect repairs pursuant to current published guidelines by ANSI/IICRC S500 "Water Damage Restoration." This will include interior environmental controls.
- 13. Alternate construction techniques may be acceptable provided a licensed design professional approves and signs and seals plans and or shop drawings for these repairs. Means and methods are the contractor's responsibility.
- 14. Conform to any special inspection and testing schedules issued by the engineer.
- 15. Contractor is solely responsible for adherence to all applicable safety requirements for work at heights.
- 16. Contractor shall remain on alert for signs of mold during repairs and construction.
- 17. Energy code requirements have not been reviewed. Scope of work for this project is structural only. Integration of existing building systems with vapor retarders, application of sealants, flashing and other items are the responsibility of the contractor.
- 18. Stability during construction is the responsibility of the contractor. Structure as detailed is intended to be stable once all sheathing and fasteners are in place.

Discovery is ongoing. Additional testing and inspections may need to be performed and additional and/or supplemental information and opinions may be contained in future reports issued by Forensic Building Science, Inc and RJH & Associates, Inc. This report is the exclusive property of the client noted previously and cannot be relied upon by a third party. Copies of this report are released to third parties only by written permission of the client.

Please contact our office should you have any questions or need additional information.

Respectfully submitted,

Ryan Nierengarten February 27, 2018
Date

FBS Director of Field Operations

February 27, 2018

Kevin Steinke Date

Field Investigator & Project Estimator, Forensic Building Science, Inc.

February 27, 2018

Tom Irmiter, President, Forensic Building Science, Inc. Building Causation, Code and Damages Consultant

Date

Pabeit Augusa

February 27, 2018

Date

Robert Hinojosa, PE, RRC, REWC, RWC, RBEC President/CEO

RJH & Associates. Inc.

